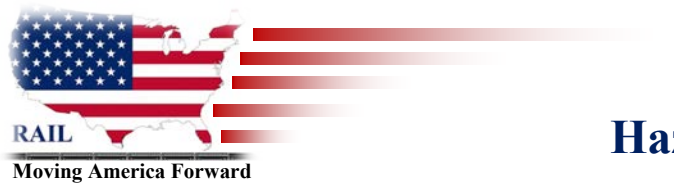
FEDERAL RAILROAD ADMINISTRATION

What is the Primary Function of our Job ?



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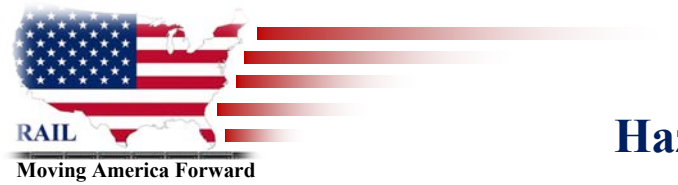
To Enforce the Hazardous Materials Regulations



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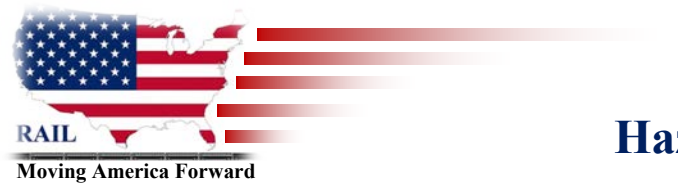
What is the Primary Function of the HM Regulations?

Safely Transport Hazardous Materials, through the Goal of



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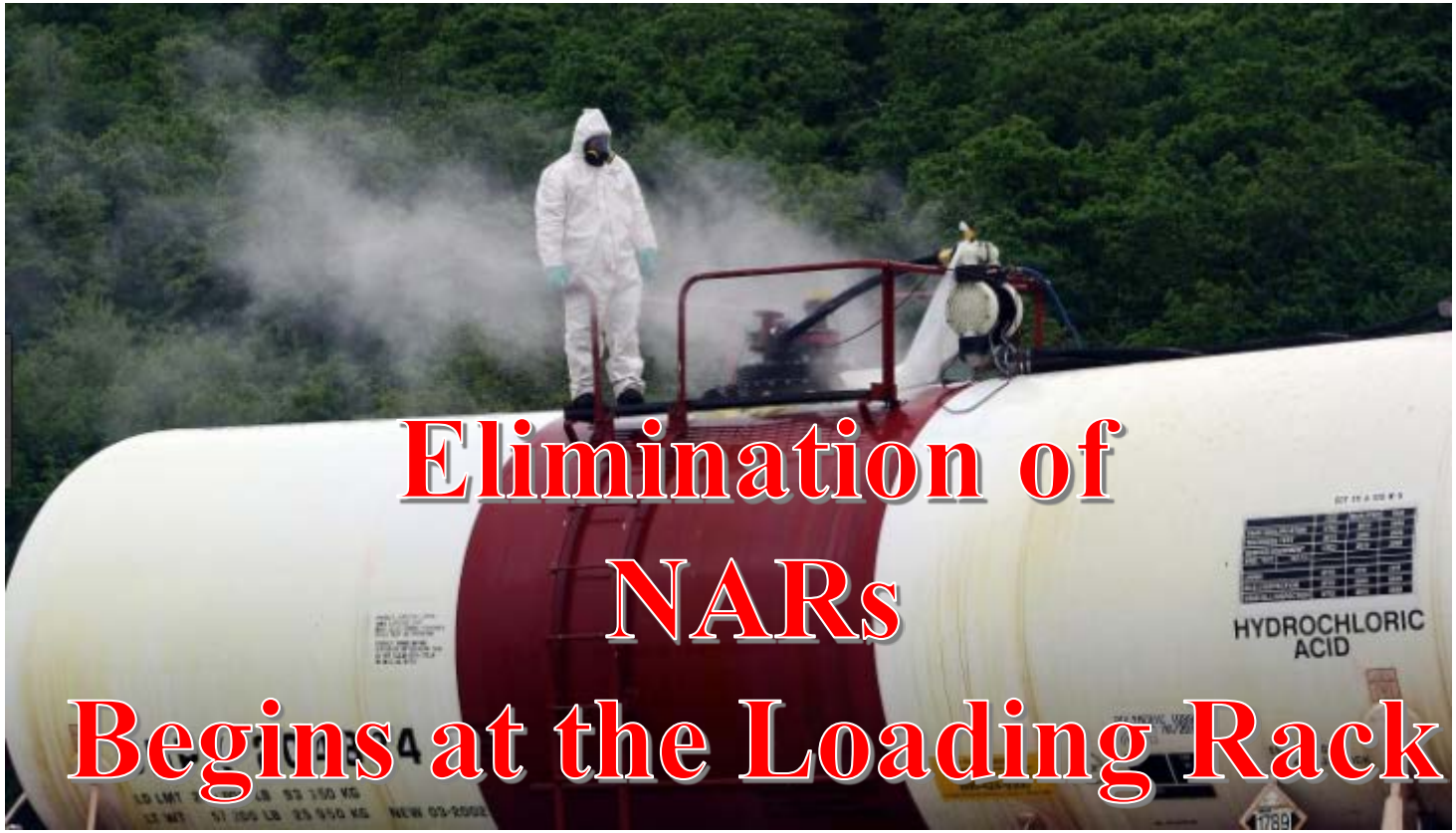

Elimination of NARs Begins at the Loading Rack

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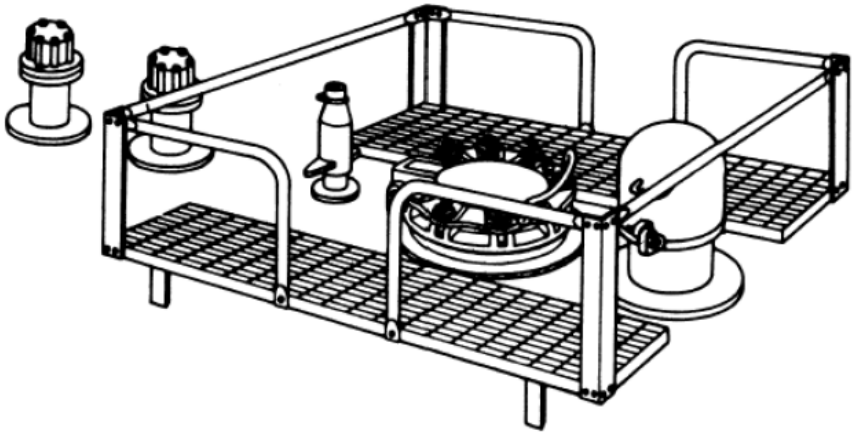
ASSOCIATION OF AMERICAN RAILROADS
BUREAU OF EXPLOSIVES



ANNUAL REPORT OF NON-ACCIDENT RELEASES OF HAZARDOUS MATERIALS TRANSPORTED BY RAIL

2016

(United States & Canada)

Published August 2017

Report BOE 16-2

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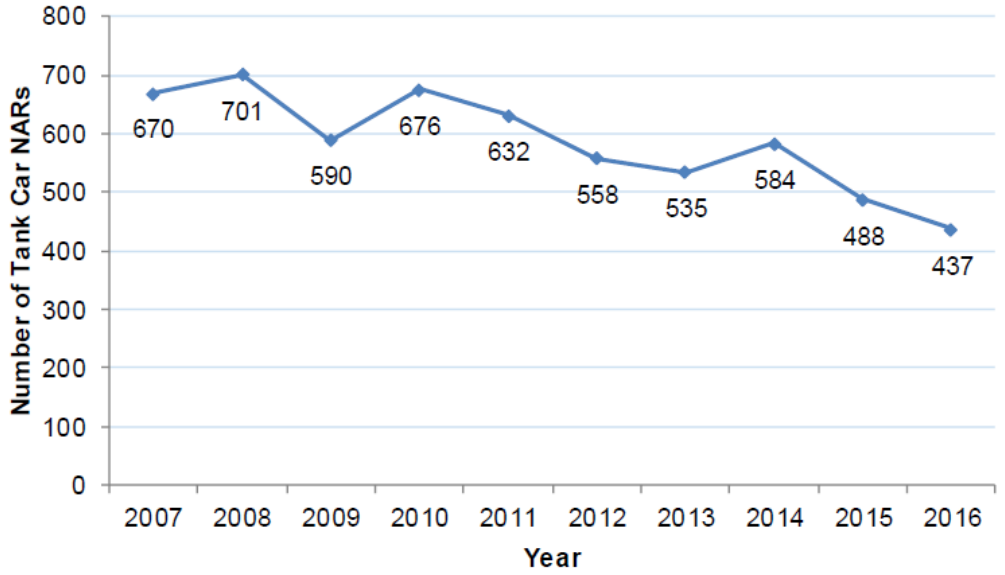
Federal Railroad Administration

AAR/BOE Tank Car NAR Breakdown

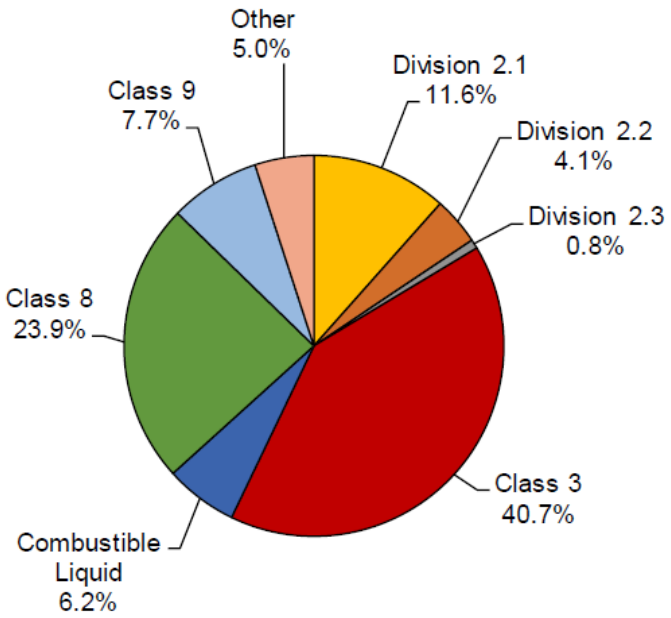
Number of Tank Car Non-Accident Releases, U.S. and Canada: 2007-2016*



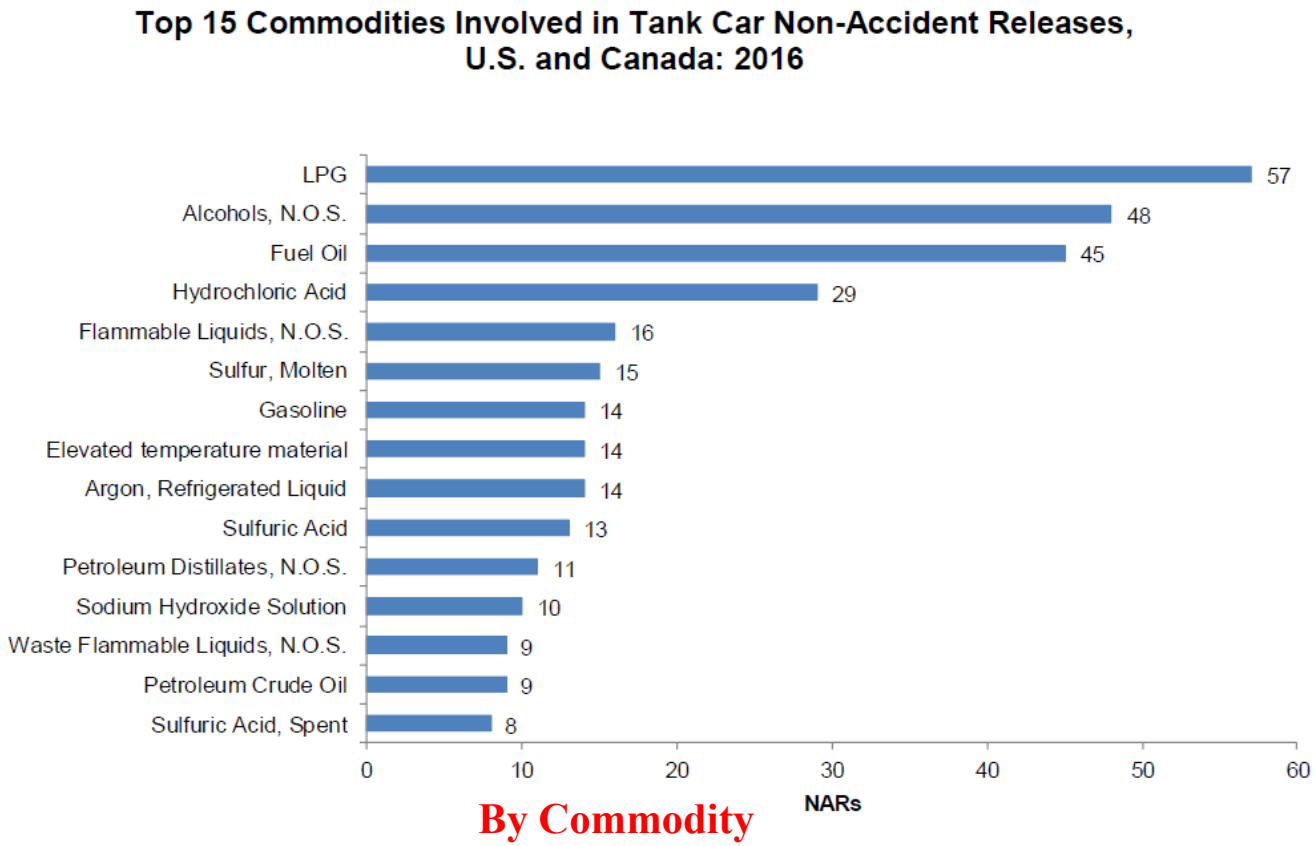
*Number of tank car NARs in 2015 was 488 instead of 542 from last year's report (This did not affect other Exhibits in last year's report as it was a typo in this particular Exhibit only).

AAR/BOE Tank Car NAR Breakdown

**Tank Car Non-Accident Releases by Hazard Class,
U.S. and Canada: 2016**

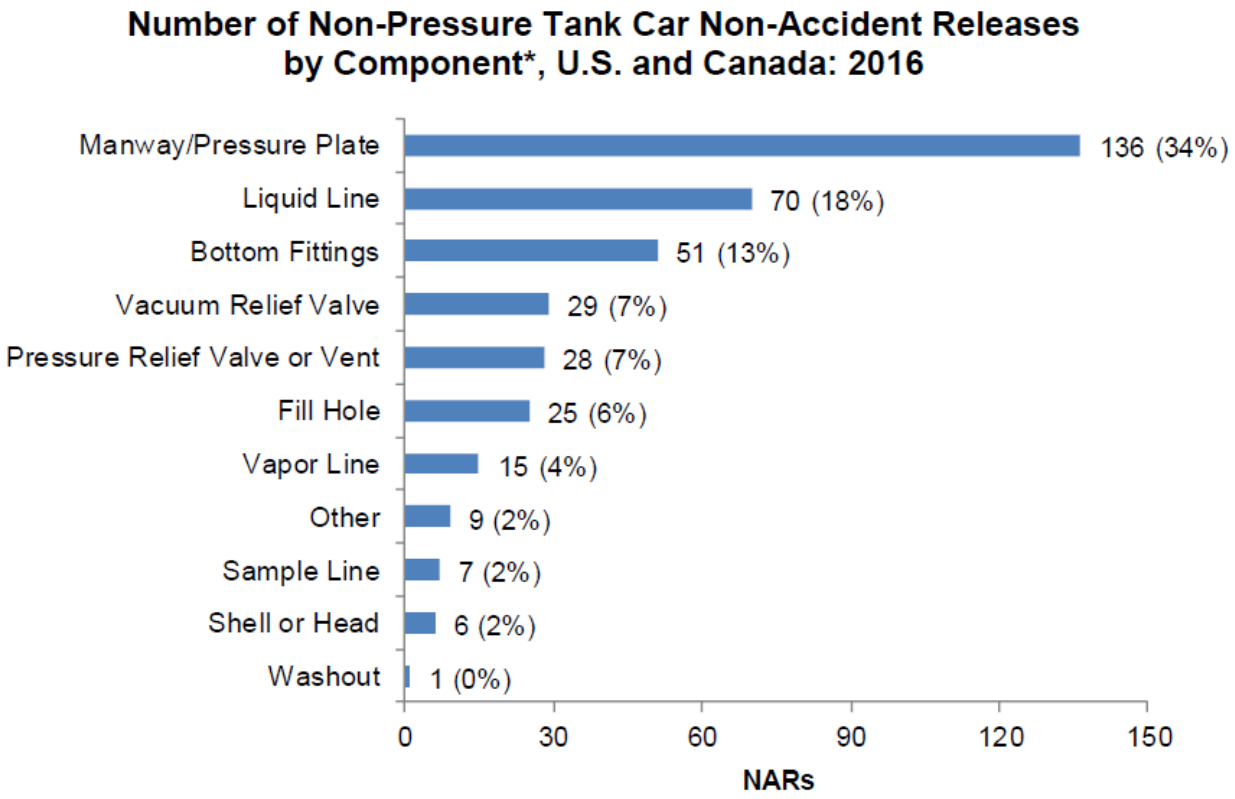


AAR/BOE Tank Car NAR Breakdown



By Commodity

AAR/BOE Tank Car NAR Breakdown



*10 NARs did not have a cause assigned.
*Total NARs = 387

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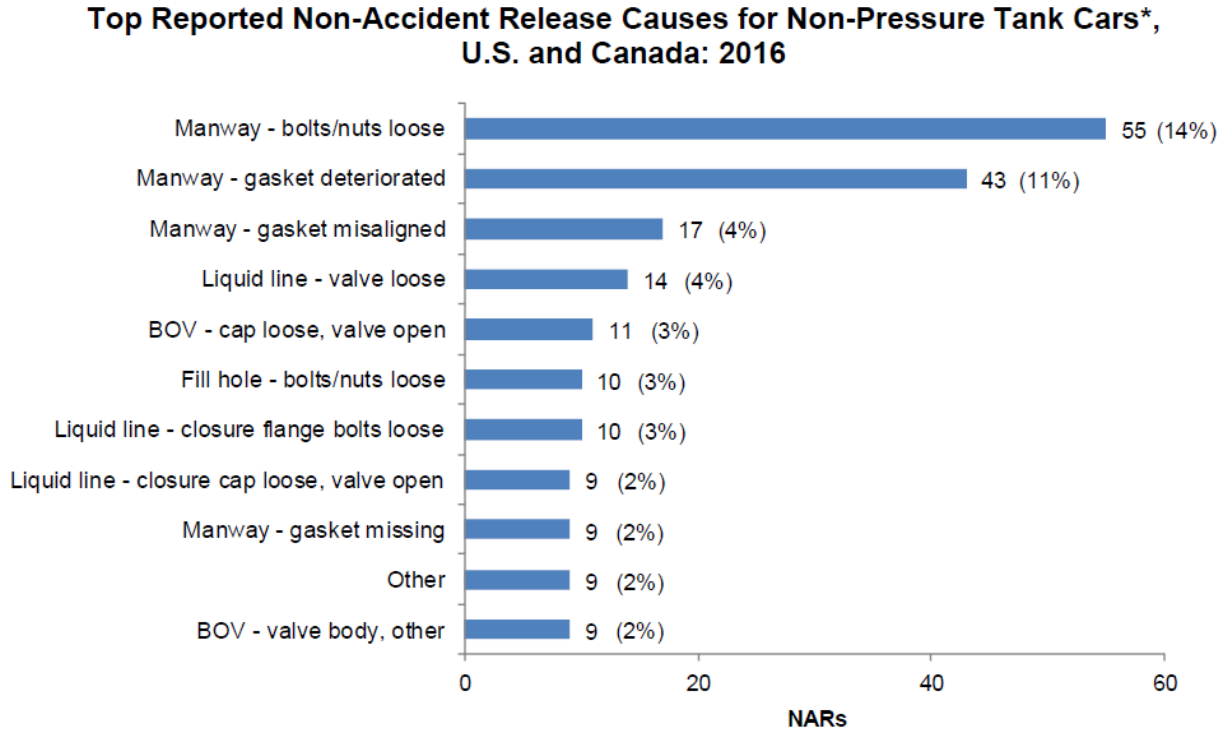
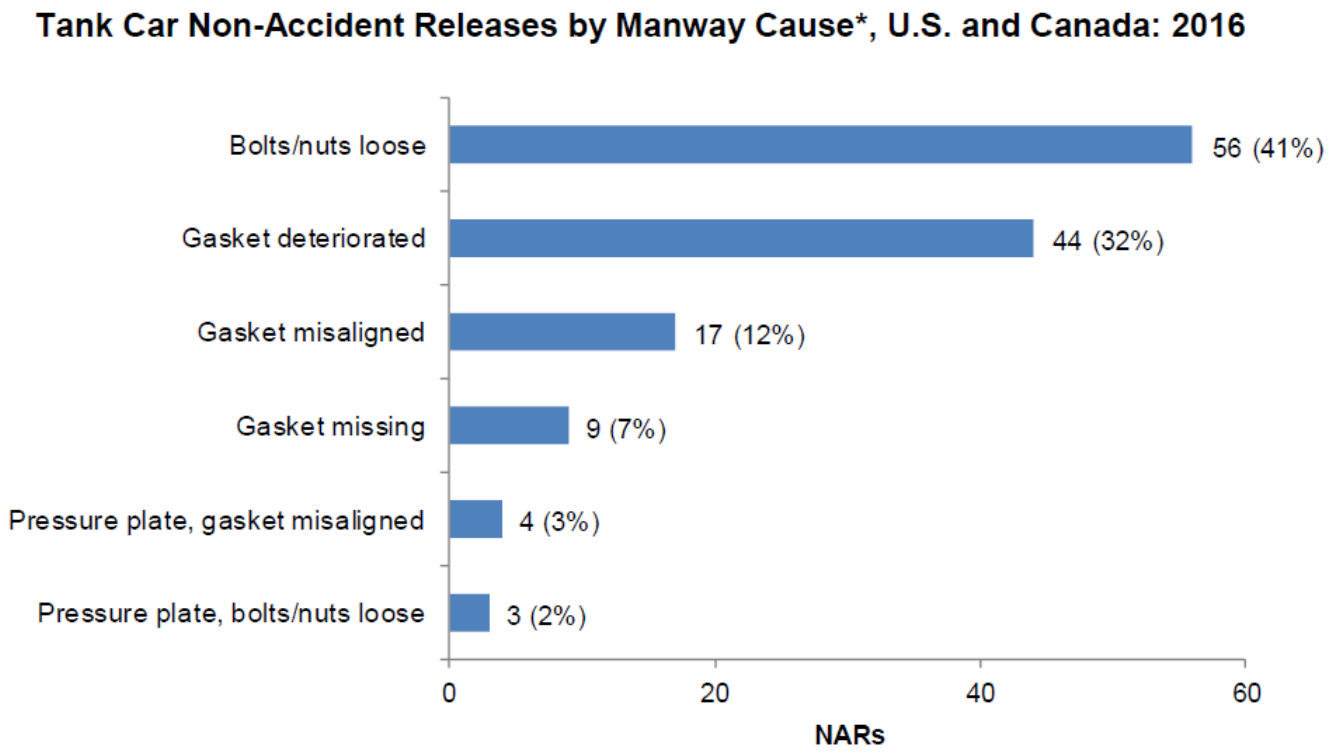
AAR/BOE Tank Car NAR Breakdown



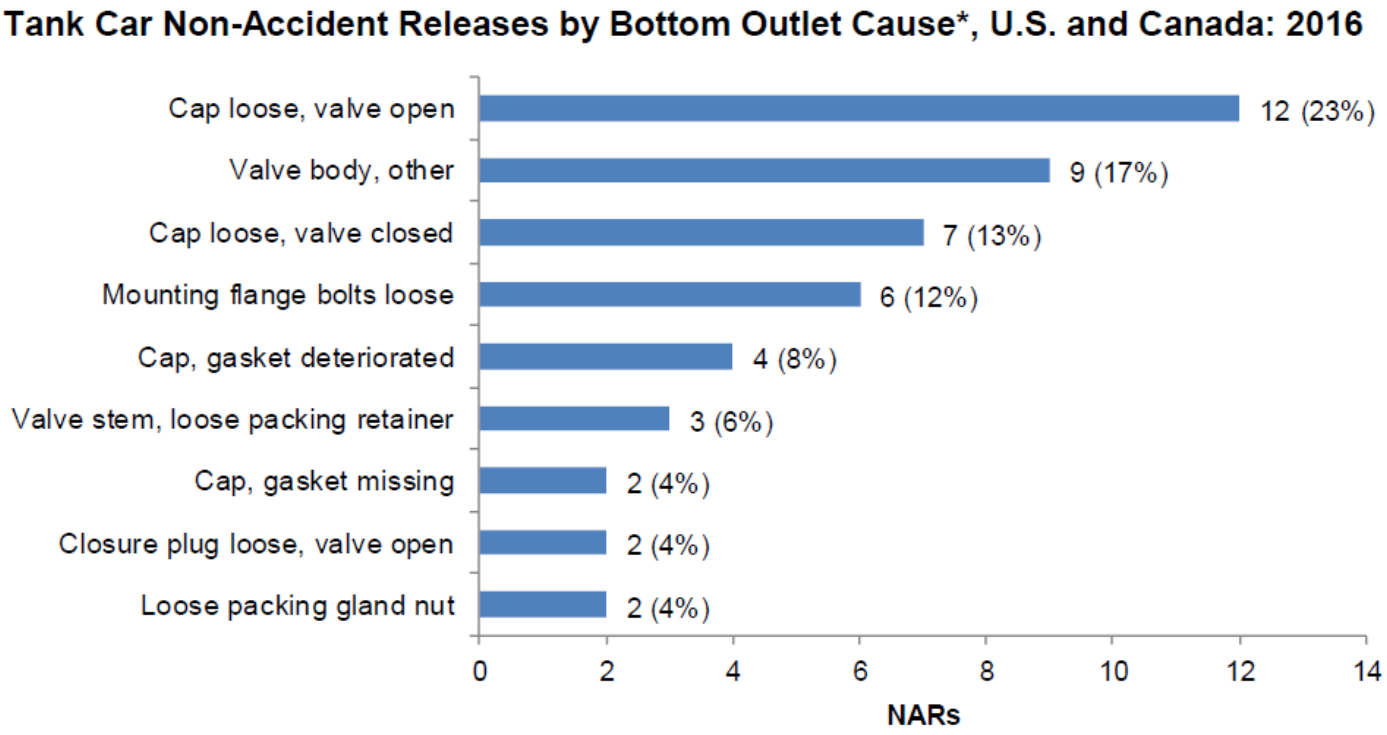
*3 Other Causes Had 7 NARs, 2 Other Causes Had 6 NARs, 1 Other Cause Had 5 NARs, 4 Other Causes Had 4 NARs, 6 Other Causes Had 3 NARs, 22 Other Causes Had 2 NARs, 57 Other Causes Had 1 NAR, 10 NARs did not have a cause assigned.
*Total NARs = 387

AAR/BOE Tank Car NAR Breakdown



*2 Other Causes Had 2 NAR Each, 1 Other Cause Had 1 NAR Each.
*Total NARs = 138

AAR/BOE Tank Car NAR Breakdown



*5 Other Causes Had 1 NAR Each.
Total NARs = 52

Elimination is Achieved through

Prior to Loading Rack observation review;

- **Training of Loading Rack employees**
- **SOP's (Standard Operating Practices) pertaining to the loading/unloading of tank cars**

Elimination is Achieved through

Tank Car Selection
Tank Car Preloading Inspection
Tank Car Loading
Tank Car Post Loading Inspection

Tank Car Selection

Selection begins at the Hazardous Materials Table 49 CFR §172.101

Example: ***UN1987//Alcohols n.o.s.,//PGI***

							Packaging (§173.***)		
Symbols	Hazardous Material Description and Proper Shipping Names	Hazard Class or Division	Identification Numbers	PG	Label Codes	Special Provisions (§172.102)	Exceptions	Non-Bulk	Bulk
1	2	3	4	5	6	7	(8A)	(8B)	(8C)
	Alcohols, n.o.s.	3	UN1987	I	3	172, T11, TP1, TP8, TP27	4b	201	243
	Alcohols, n.o.s.	3	UN1987	II	3	172, IB2, T7, TP1, TP8, TP28	4b, 150	202	242
	Alcohols, n.o.s.	3	UN1987	III	3	172, B1, IB3, T4, TP1, TP29	4b, 150	203	242

Tank Car Selection

Symbols	Hazardous Material Description and Proper Shipping Names	Hazard Class or Division	Identification Numbers	PG	Label Codes	Special Provisions (§172.102)	Packaging (§173.***) Exceptions	Non-Bulk	Bulk
1	2	3	4	5	6	7	(8A)	(8B)	(8C)
	Alcohols, n.o.s.	3	UN1987	I	3	172, T11, TP1, TP8, TP27	4b	201	243
	Alcohols, n.o.s.	3	UN1987	II	3	172, IB2, T7, TP1, TP8, TP28	4b, 150	202	242
	Alcohols, n.o.s.	3	UN1987	III	3	172, B1, IB3, T4, TP1, TP29	4b, 150	203	

172 – This entry includes alcohol mixtures containing up to 5% petroleum products
T11 – N/A, (Portable Tanks)
TP1 – N/A (IM Portable Tanks)
TP8 – N/A (IM Portable Tanks)
TP27 - N/A (IM Portable Tanks)

Tank Car Selection

Symbols	Hazardous Material Description and Proper Shipping Names	Hazard Class or Division	Identification Numbers	PG	Label Codes	Special Provisions (§172.102)	Packaging (§173.***) Exceptions	Non-Bulk	Bulk
1	2	3	4	5	6	7	(8A)	(8B)	(8C)
	Alcohols, n.o.s.	3	UN1987	I	3	172, T11, TP1, TP8, TP27	4b	201	243
	Alcohols, n.o.s.	3	UN1987	II	3	172, IB2, T7, TP1, TP8, TP28	4b, 150	202	242
	Alcohols, n.o.s.	3	UN1987	III	3	172, B1, IB3, T4, TP1, TP29	4b, 150	203	

§173.4(b) – N/A, De minimis exceptions (Excepted Quantities)

Tank Car Selection

Symbols	Hazardous Material Description and Proper Shipping Names	Hazard Class or Division	Identification Numbers	PG	Label Codes	Special Provisions (§172.102)	Packaging (§173.***) Exceptions	Non-Bulk	Bulk
1	2	3	4	5	6	7	(8A)	(8B)	(8C)
	Alcohols, n.o.s.	3	UN1987	I	3	172, T11, TP1, TP8, TP27	4b	201	243
	Alcohols, n.o.s.	3	UN1987	II	3	172, IB2, T7, TP1, TP8, TP28	4b, 150	202	242
	Alcohols, n.o.s.	3	UN1987	III	3	172, B1, IB3, T4, TP1, TP29	4b, 150	203	

§173.201 – N/A, Non-bulk packagings for liquid hazardous materials in Packing Group I

Tank Car Selection

Symbols	Hazardous Material Description and Proper Shipping Names	Hazard Class or Division	Identification Numbers	PG	Label Codes	Special Provisions (§172.102)	Packaging (§173.***) Exceptions	Non-Bulk	Bulk
1	2	3	4	5	6	7	(8A)	(8B)	(8C)
	Alcohols, n.o.s.	3	UN1987	I	3	172, T11, TP1, TP8, TP27	4b	201	243
	Alcohols, n.o.s.	3	UN1987	II	3	172, IB2, T7, TP1, TP8, TP28	4b, 150	202	242
	Alcohols, n.o.s.	3	UN1987	III	3	172, B1, IB3, T4, TP1, TP29	4b, 150	203	

§173.243 – Bulk packaging for certain high hazard liquids and dual hazard materials which pose a moderate hazard. When § 172.101 of this subchapter specifies that a hazardous material be packaged under this section, only the following bulk packagings are authorized, subject to the requirements of subparts A and B of part 173 of this subchapter and the special provisions specified in column 7 of the § 172.101 table.

Tank Car Selection

(a) Rail cars: Class DOT 103, 104, 105, 109, 111, 112, 114, 115, 117, or 120 fusion-welded tank car tanks; and Class 106 or 110 multiunit tank car tanks. Additional operational requirements apply to high hazard flammable trains (see §171.8 of this subchapter) as prescribed in §174.310 of this subchapter. ***Except as otherwise provided in this section, DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized to transport Class 3 (flammable liquids) in Packing Group I, unless retrofitted to the DOT Specification 117R retrofit standards or the DOT Specification 117P performance standards provided in part 179, subpart D of this subchapter.***

Tank Car Selection

(1) DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized for transport of Class 3 (flammable liquids) unless retrofitted prior to the dates corresponding to the specific material in the following table:

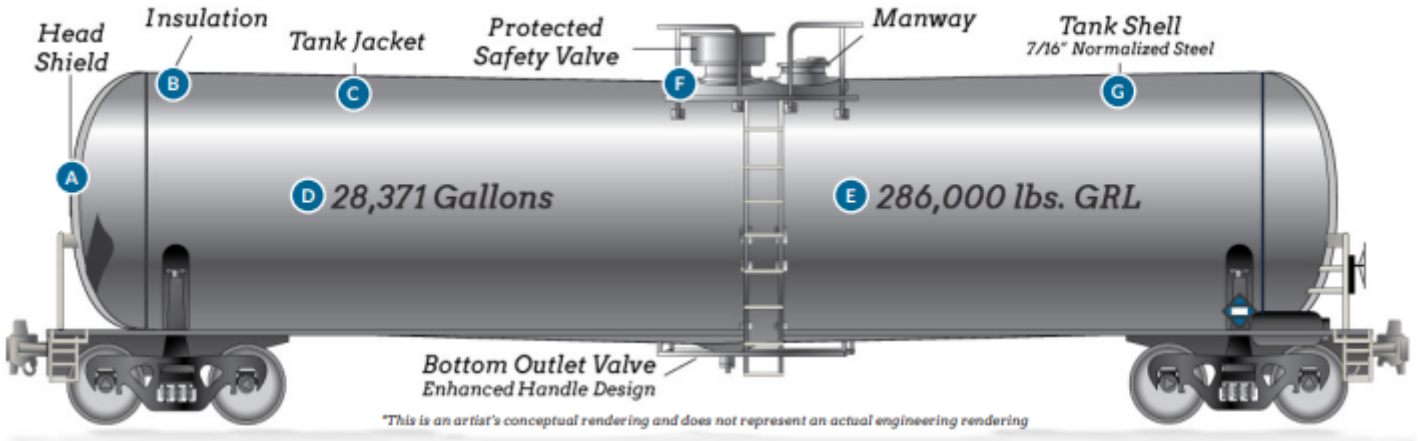
Material	Jacketed or non-jacketed tank car	DOT-111 not authorized on or after	DOT-111 built to the CPC-1232 not authorized on or after
Unrefined petroleum products	Non-jacketed Jacketed	January 1, 2018 March 1, 2018	April 1, 2020 May 1, 2025
Class 3, PG I (flammable liquid) other than unrefined petroleum products	Non-jacketed Jacketed	May 1, 2025 May 1, 2025	May 1, 2025 May 1, 2025

(2) Conforming retrofitted tank cars are to be marked "DOT–117R."

(3) Conforming performance standard tank cars are to be marked "DOT–117P."

Tank Car Selection

Concept of a CPC 1232 Tank Car



A Head Shield - Half-inch steel plating is added to reinforce the ends of the tank car. Some cars have full-height head shields, while others have half-height head shields.

B Insulation - Jacketed tank cars have a layer of insulation between the tank shell and jacket to keep the contents at an appropriate temperature during shipping, loading and unloading.

C Tank Jacket - The tank jacket is a sheet of 1/8" steel surrounding the entire tank. The jacket is an effective means of protecting a car after a derailment occurs, reducing the chances of leaks.

D Capacity - Jacketed cars would have various capacities, one example being 28,371 gallons.

E Gross Rail Load - Jacketed tank cars have a gross rail load of 286,000 lbs. due to the added weight of steel jackets and other components.

F Top Fittings - Tank cars have top fittings protection including a 3/4" structural steel housing, with the safety valve contained within the housing.

G Tank Shell - Tank shells are made of normalized steel that has been heat-treated and air-cooled for a more uniform structure. Some CPC-1232 tank cars substitute half-inch, normalized steel tank shells in place of jackets.

Tank Car Selection

Common CPC 1232 Tank Car

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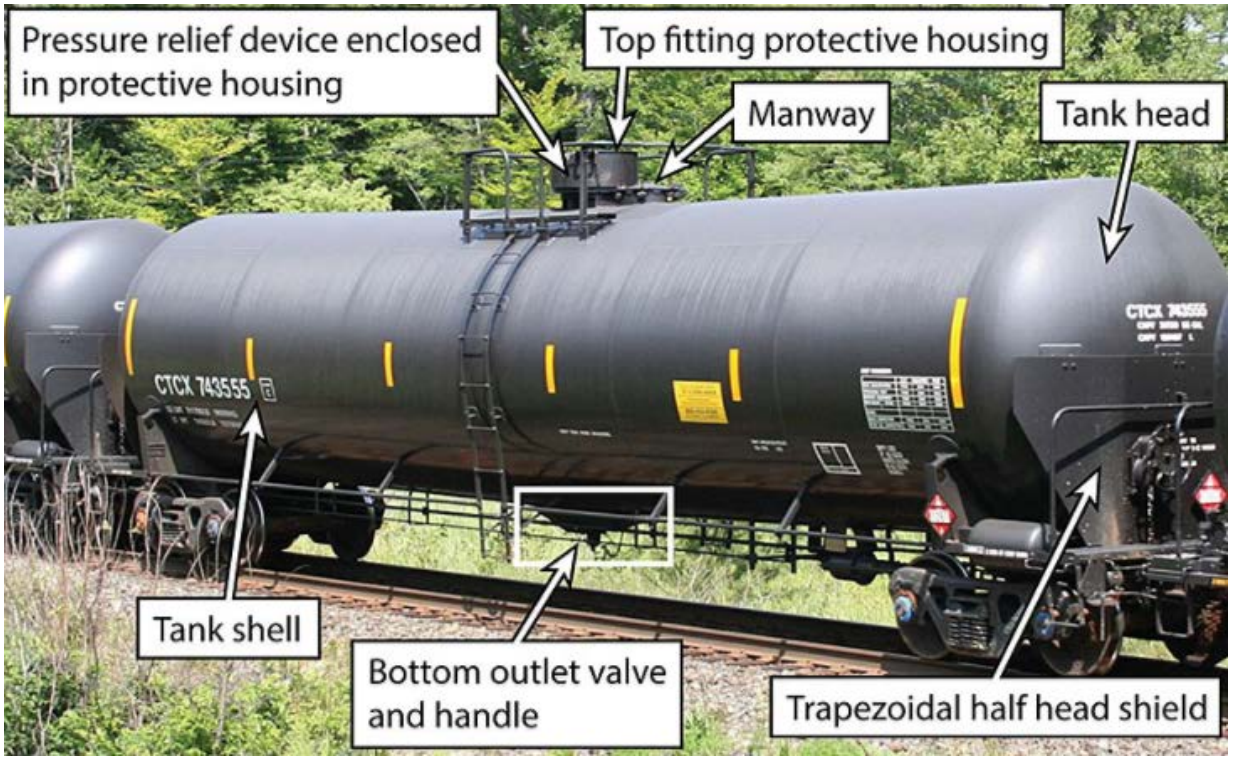
Tank Car Selection

Common CPC 1232 Tank Car

Tank Car Selection

Common CPC 1232 Tank Car



Tank Car Preloading Inspection

Markings

Shell

Bolster Pad/Stub Sill

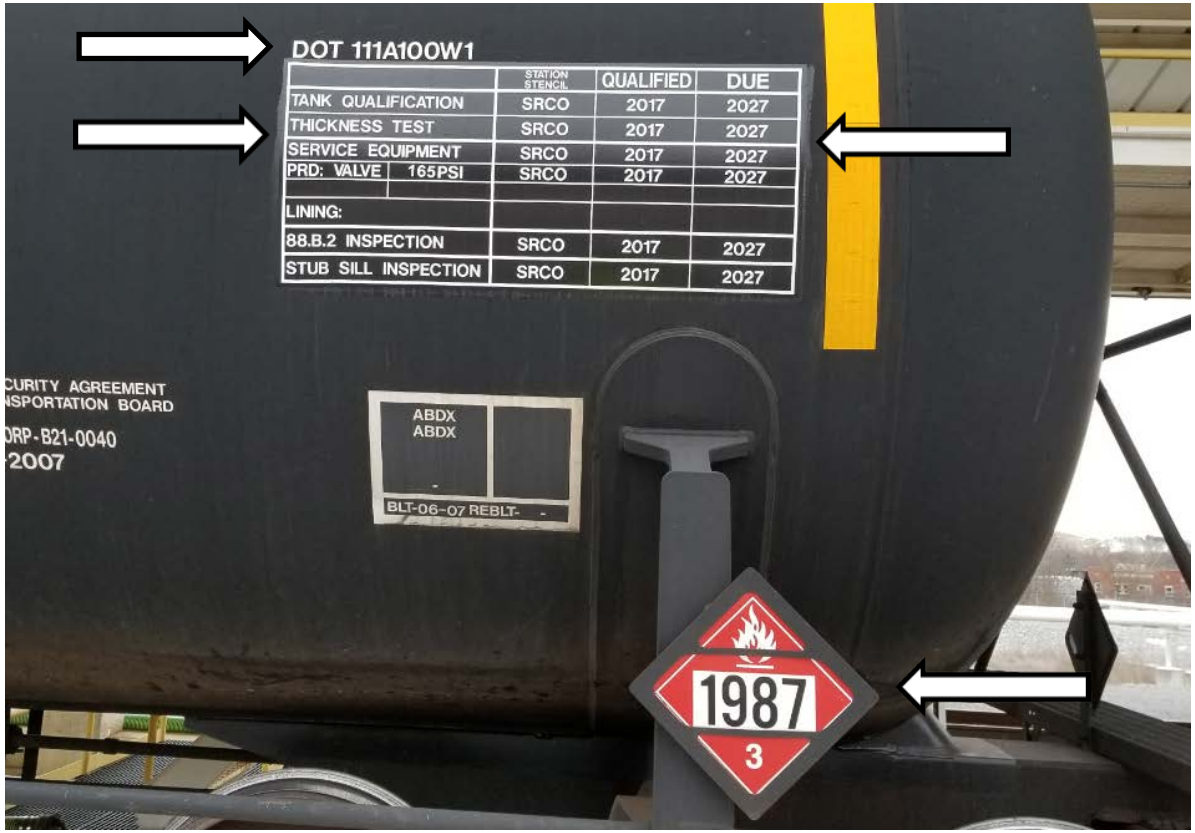
Service Equipment

Tank Car Preloading Inspection

Markings

Tank Car Preloading Inspection

Markings



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Tank Car Preloading Inspection

Bolster Pad/Stub Sill

A visual inspection of these components looking for;

§173.31(d) Examination Before Shipping

(1) No person may offer for transportation a tank car containing a hazardous material or a residue of a hazardous material unless that person determines that the tank car is in proper condition and safe for transportation. As a minimum, each person offering a tank car for transportation must perform an external visual inspection that includes:

(i) Except where insulation or a thermal protection system precludes an inspection, the tank shell and heads for abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other condition that makes the tank car unsafe for transportation

Tank Car Preloading Inspection

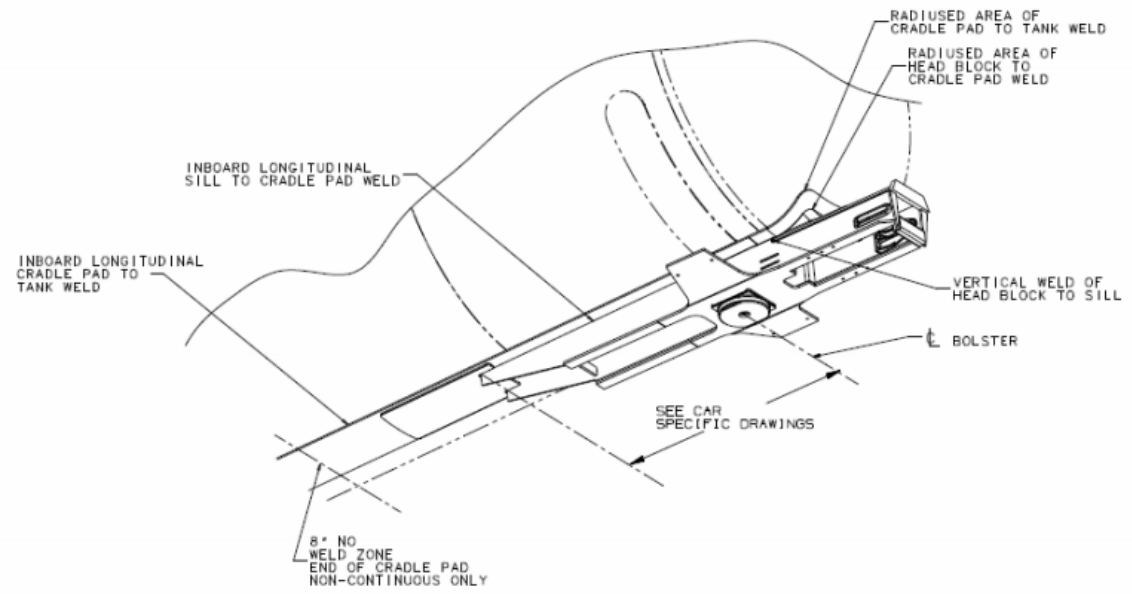
Shell

A visual inspection of the tank shell looking for;

Tank Car Preloading Inspection

Bolster Pad/Stub Sill

A visual inspection of these components looking for;



Tank Car Preloading Inspection

Bolster Pad/Stub Sill

A visual inspection of these components looking for;

Tank Car Preloading Inspection

Bolster Pad/Stub Sill

A visual inspection of these components looking for;

§173.31(d) Examination Before Shipping

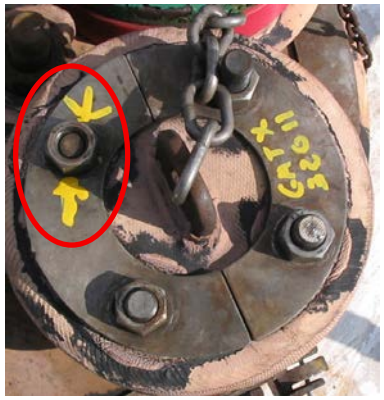
(1) No person may offer for transportation a tank car containing a hazardous material or a residue of a hazardous material unless that person determines that the tank car is in proper condition and safe for transportation. As a minimum, each person offering a tank car for transportation must perform an external visual inspection that includes:

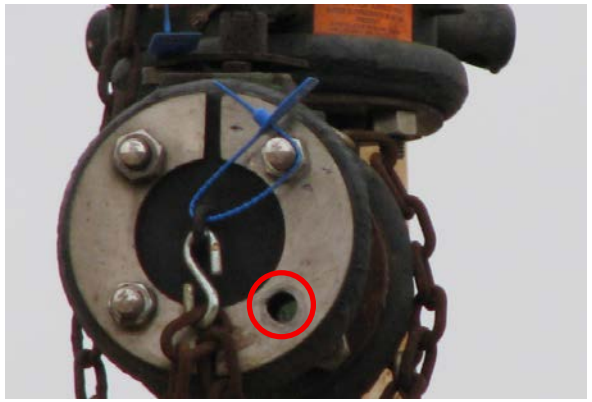
(ii) The piping, valves, fittings, and gaskets for corrosion, damage, or any other condition that makes the tank car unsafe for transportation;

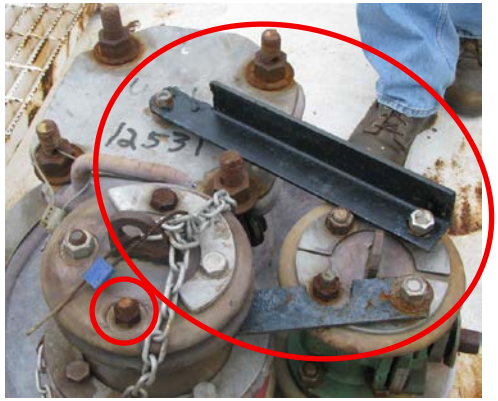
(iii) For missing or loose bolts, nuts, or elements that make the tank car unsafe for transportation;

Tank Car Preloading Inspection

Service Equipment







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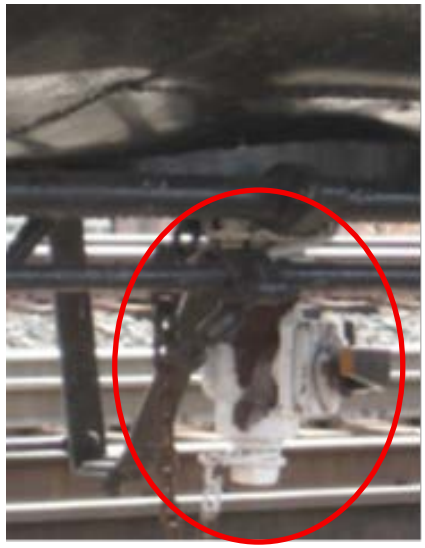
Tank Car Preloading Inspection

Service Equipment



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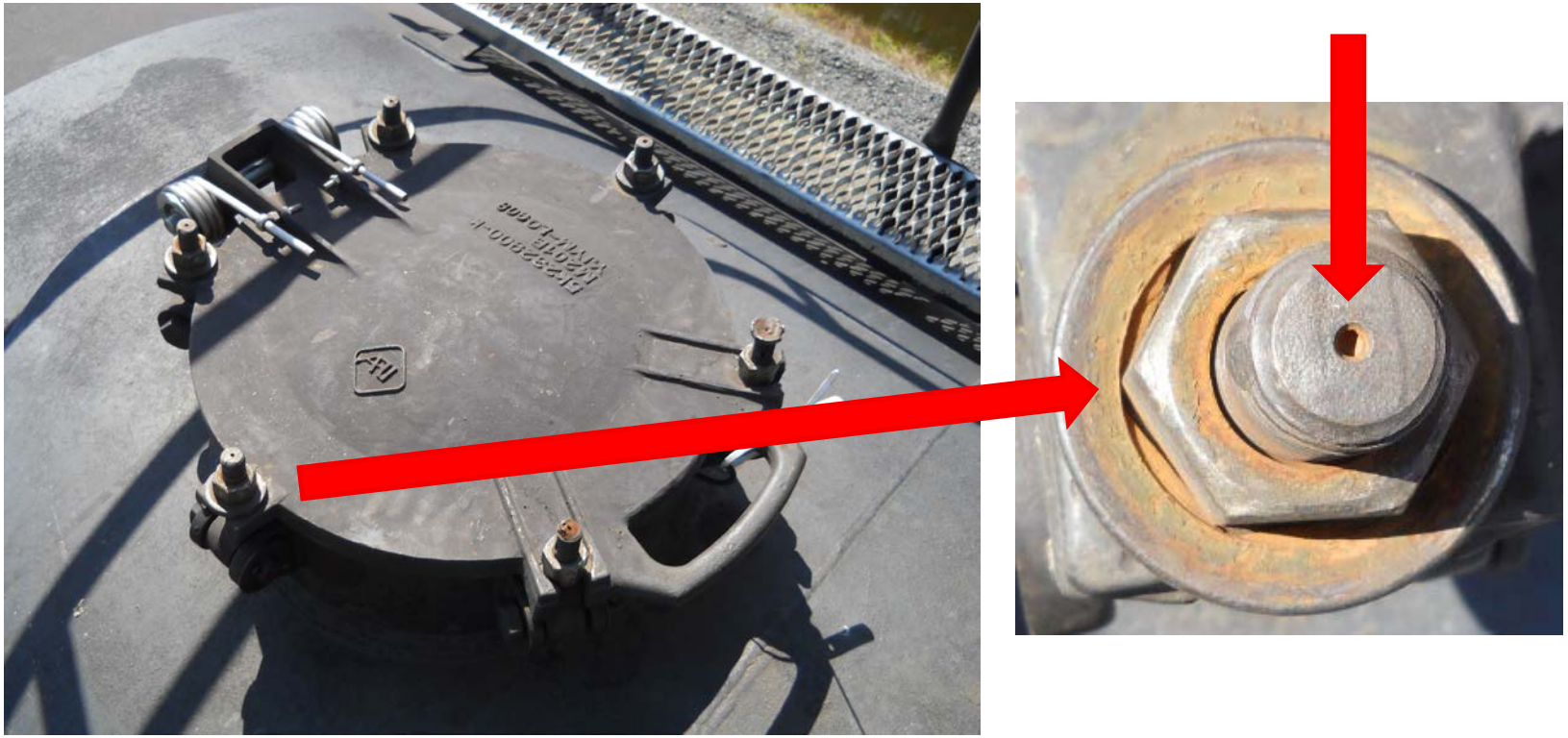
Tank Car Preloading Inspection

Service Equipment



Tank Car Preloading Inspection

Service Equipment

Bent manway lugs and missing eyebolt stops.

Tank Car Preloading Inspection

Service Equipment

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Tank Car Preloading Inspection

Service Equipment

Top of Gage Rod is marked with Specific Gravity, Serial Number and Car Number (on newer assemblies), the Specific Gravity marked on the gage rod must match the commodity.

Many gage rods have multiple scales printed on them specific to different commodities, is the loader referring to the correct scale?

Tank Car Preloading Inspection

Service Equipment

Does the assembly components numbers correspond?

Tank Car Loading

Heel

Package Type

- **Non-Jacketed**
- **Thermal Protection System**
- **Insulated**

Innage/Outage Calculation

(Industry Standard Consideration)

Tank Car Loading

Consideration of Industry Standards such as;

- **American Petroleum Institute RP 3000-Classifying and Loading of Crude Oil into Rail Tank Cars**
- **Association of American Railroads AAR Pamphlet 34**
- **Chlorine Institute Recommended Practices Pamphlet 87-Sidium Hydroxide Solution and Potassium Hydroxide Solution**
- **Compressed Gas Association CGA G-6.4-2015 Safe Transfer of Liquified Carbon Dioxide in insulated Cargo Tanks, Tank Cars, and Portable Containers**
- **National Propane Gas Association Performing Railcar Product Transfers**
- **Propane Education & Research Council CEPT 3.6-Performing Railcar Product Transfers**
- **Renewable Fuels Association Best Practices for Rail Transportation of Fuel Ethanol**
- **The Sulphur Institute Molten Sulphur Rail Tank Car Loading and Unloading Operations**

Tank Car Loading

IS the shipper considering a heel before filling the tank car?

Tank Car Loading

§ 173.24b Additional general requirements for bulk packagings.

(a)*Outage and filling limits.*

(1) Except as otherwise provided in this subchapter, liquids and liquefied gases must be so loaded that the outage is at least five percent for materials poisonous by inhalation, or at least one percent for all other materials, of the total capacity of a cargo tank, portable tank, tank car (including dome capacity), multi-unit tank car tank, or any compartment thereof, at the following reference temperatures -

(i) 46 °C (115 °F) for a noninsulated tank;

(ii) 43 °C (110 °F) for a tank car having a thermal protection system, incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour/per square foot/ per degree F) temperature differential; or

(iii) 41 °C (105 °F) for an insulated tank.

Tank Car Loading

How is the shipper determining if the jacketed tank car is insulated?

(ii) 43 °C (110 °F) for a tank car having a thermal protection system, incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour/per square foot/ per degree F) temperature differential; or

Determining weather or not the package is insulated is crucial to determining outage and consequently eliminating an overfill reducing the chance of the product's expansion and possible NAR

Tank Car Loading

Did the shipper perform an outage calculation?

Is the shipper using Load Meter?

- **Does the Load Meter system incorporate a computer package the calculates outage?**
- **Does the package incorporate all parameters needed to calculate outage?**
- **How did the program identify if the jacketed tank car meets the insulation requirements of §173.24b(a)(1)(ii)?**

Does the shipper measure the outage after the loading of the product is complete?

Tank Car Post Loading Inspection

(d)Examination before shipping.

(1) No person may offer for transportation a tank car containing a hazardous material or a residue of a hazardous material unless that person determines that the tank car is in proper condition and safe for transportation. As a minimum, each person offering a tank car for transportation must perform an external visual inspection that includes:

(iv) All closures on tank cars and determine that the closures and all fastenings securing them are properly tightened in place by the use of a bar, wrench, or other suitable tool;

(v) Protective housings for proper securement;

(vi) The pressure relief device, including a careful inspection of the rupture disc in non-reclosing pressure relief devices, for corrosion or damage that may alter the intended operation of the device. The rupture disc is not required to be removed prior to visual inspection if the tank car contains the residue, as defined in § 171.8 of this subchapter, of a Class 8, PG II or PG III material with no subsidiary hazard or the residue of a Class 9 elevated temperature material;

(vii) Each tell-tale indicator after filling and prior to transportation to ensure the integrity of the rupture disc;

Tank Car Post Loading Inspection

What type of tool did the operator use to secure the closures?

Manway Closure

Wrench

Tee handle

Pneumatic impact wrench (1/2” or 3/4”)

Note: check the manufacturers torque range. A 1/2” pneumatic wrench can develop 700 plus foot pounds of to torque and a 3/4” pneumatic wrench can develop1300 plus foot pounds of torque)

Does the shipper conceder OEMs?

Shipper Closeout Considerations

Did the Loading Rack employees follow the SOPs?

Specifically discuss and note any discrepancies between the SOP procedures and operator implementation of the loading/unloading of tank cars.

Shipper Closeout Considerations

Along with defects noted during your audit noting and explaining what industry standards where not followed both verbally and on your inspection report as 173 OBSREV are essential.

Although not following an industry standard may not be a regulation, by being notified of the non-adherence of the standard and a subsequent NAR occurs in transportation the investigation will note correlation of the NAR to the non-adherence if applicable. Consequentially elevating the significance of the causal factor.

Questions?